

Summary of Stakeholder Comments in Response to the Draft 3 Version 6.0 ENERGY STAR Displays Specification (Distributed February 10, 2012)

Topic No.	Topic	Comment	ENERGY STAR Response
1	All Comments	All Comments	See separate responses from the Department of Energy to comments on the test method.
2	Definitions - Product Type	<p>One stakeholder commented that monitors and workstations, including signage, in the size range 30"-42" demand high luminance and high resolution, and therefore asked for both computer monitors and signage to be treated the same.</p> <p>Another stakeholder recommended to further distinguish signage displays as display devices with a toggled power switch. The challenge of trying to define signage displays could be eliminated by applying an efficiency based test consistent with computer monitors.</p> <p>Another stakeholder suggested using the pixels per inch (ppi) metric instead of pixels per square inch, mentioning that it's one of the most common units of resolution measurement.</p>	<p>According to the EPA dataset, professional/signage displays have a lower pixel density than computer monitors, providing an appropriate distinguishing factor between the two product types. Though some stakeholders provided feedback that the proposal in Draft 3 did not provide a sufficient On Mode power allowance for computer monitors over 30 inches, because they deliver functionality similar to that of a workstation computer, EPA does not have data to support providing additional power beyond that already provided as displays increase in screen size. As such, EPA maintains the previously proposed power limits for computer monitors of 30 to 61 inches.</p> <p>Even though signage displays are typically equipped with a toggled power switch, many monitors and digital picture frames also have a hard off-switch, which may render this distinguishing factor ineffective. To ensure accurate testing, DOE and EPA have clarified that Computer Monitors with a diagonal screen size 30" and over shall be tested the same way as displays less than 30".</p> <p>Even though pixels per inch (ppi) is also a popular resolution metric used in industry, EPA proposes to keep the pixel density (pixels per square inch) metric since monitors, signage displays, and digital picture frames are manufactured with different aspect ratios. Given this variance, the pixel density metric is more accurate and consistent.</p>
3	Definitions - Luminance	One stakeholder supported EPA's intention to record the maximum measured luminance as a useful data point for future analysis. Another stakeholder requested for examples to be included in the specification for the maximum reported and maximum measured luminances as further clarification.	EPA has revised the definitions for the Maximum Reported Luminance and Maximum Measured Luminance, providing further clarification on the distinction between the two definitions.
4	Definitions - ABC	One stakeholder requested that the Definitions section mention that the "as-shipped luminance" term does not apply to ABC-enabled displays, since the luminance of these products would vary based on the ambient lighting conditions of the location in which it is installed. There should also be a definition for ambient light conditions.	EPA has included a clarification for the "As-shipped Luminance" definition to indicate that the luminance of ABC-enabled displays may vary based on the ambient light conditions of the location in which the display is installed. In response to stakeholder feedback, EPA also proposes a definition for ambient light conditions.
5	Definitions - General	<p>One stakeholder requested additional detail in the definition indicating how a representative model is used in product testing and qualification, suggesting adopting the language from the Computers specification.</p> <p>Another stakeholder recommended harmonizing the On Mode, Sleep Mode, and Off Modes with the DOE TVs Notice of Proposed Rulemaking (NOPR).</p>	<p>The definition for Representative Model is already mostly harmonized with the definition in the Computers specification. EPA has made a minor edit to the definition to further align the language.</p> <p>EPA understands the suggestion to harmonize with operation mode definitions provided in the DOE TVs Notice of Proposed Rulemaking (NOPR) for Television Sets (TVs) given the similarity of TVs and displays. However, given the differences in usage patterns, EPA considers the proposed definitions to be more applicable to displays. An example of a difference in usage patterns is Sleep Mode for monitors, which is typically entered when a host computer goes to sleep, and Standby Mode for TVs, which is typically entered upon direct actuation by user via a remote control. Should the final DOE TV Test Procedure include signage displays within its scope, EPA will harmonize the definitions, where applicable.</p>

6	Scope	<p>One stakeholder suggested changing item 2.1.1.i to “computer displays/monitors” and item 2.2.2.vi to “Mobile computing and communication devices (e.g. tablet computers, slates, electronic readers, smartphones)”.</p> <p>Another stakeholder inquired whether their large interactive display product would be eligible for the ENERGY STAR program. Another stakeholder agreed that signage displays have different use cases, both in On and Sleep, than monitors, mentioning that signage displays often have lower resolution requirements than computer monitors. The stakeholder suggested a power cap instead of a size cap, as this would allow larger sizes to qualify while maintaining a list of energy efficient products. The energy cap could be the power limit at 60", 70", or 80". As an example, if a customer specified a 240-inch diagonal video wall, it could be built with sixteen 60-inch displays or only nine 80-inch displays, with the latter consuming lower overall energy if the energy consumption of the individual models is the same.</p>	<p>EPA believes that computer displays that differ from typical computer monitors are covered in the Included Products section by item 2.1.1.iv. In response to stakeholder feedback, EPA has modified Excluded Products section 2.2.2.vi. to include slates.</p> <p>EPA appreciates the stakeholder feedback on applying a power cap instead of a size cap. Given the lack of enough data received on which to base proposed power limits for products larger than 61", EPA proposes to keep the 61" size cap for Version 6.0.</p>
7	On Mode - Levels	<p>One stakeholder commented that the On Mode levels are too strict for many screen sizes, specifically mentioning the 12"~21.5", 22"~27" and greater than 30" size ranges.</p> <p>Another stakeholder commented that the levels are too strict for 18.5" size and for 20", 21.5", and 27" sizes, as well as for all IPS displays. This stakeholder recommended that the 23" limit should be 26W.</p> <p>Another stakeholder mentioned that EPA needs to consider unit shipment data in addition to targeting 25% of models on the market. Thus, when lowering the levels, the impact will be far greater on displays in the 20" to 27" range.</p>	<p>During its analysis of the qualified product data, EPA made sure to consider the ENERGY STAR market penetration in terms of number of available models as well taking into account which sizes were most popular in the market place, based on the most recently available unit shipment data. Based on initial comments received on the February 22, 2012 webinar, on March 6, EPA revised the On Mode power levels for displays with a diagonal screen size 0" < d < 30" and any computer monitors with a diagonal screen size 30" and larger to allow greater product qualification in key sizes that are popular with consumers, namely 19, 20, 22, 23 and 25 inch monitors. The revised On Mode Power levels provide greater selection of top performing products that remain cost effective. For some of the sizes in the 17"-24" size range, where the unit shipment is highest, the percentage passing rates are above 25%.</p>
8	On Mode - Dataset	<p>One stakeholder recommended that EPA consider the newest models when evaluating the on mode criteria, since the goal is to maintain a relevant standard over a two year cycle.</p> <p>Another stakeholder recommended that EPA use the following strategies to achieve a 25% pass rate when the Displays specification becomes effective in early 2013: a) revise the Draft 3 dataset so that it better reflects the current market, similarly to the Televisions specification; b) increase the stringency of the On Mode Power Requirements (PON_MAX) to account for natural improvements in market adoption between the specification revision and the effective date. Internal research suggests that eighteen months is the longest amount of time that most monitor models are sold through major retailers or manufacturer Web sites. The Draft 3 Version 6 dataset was developed in August 2011, but the Version 6 specification will not be effective until early 2013, which represents at least a sixteen month lag time between when the Version 6 dataset was developed and when it will become effective. By filtering out older models, EPA would still be left with over 1,700 display products or 62% of the current dataset. In addition, lowering the proposed levels by 13% would result in roughly a 20% pass rate for the revised dataset, including respective pass rates of 21% and 16% for the popular 17 – 23" and 23 – 25" size bin categories.</p>	<p>EPA appreciates the data analysis conducted by stakeholders to assess the impact of narrowing the dataset to models released in 2011-2012. However, as mentioned previously, EPA does not intend to consider models only introduced to the market in 2011 in its analysis since many models introduced in 2010 are still being sold today. A review of the qualifying and non-qualifying offerings of ENERGY STAR Displays Partners indicates that EPA's dataset is representative of models currently on the market.</p>

9	On Mode - Other	<p>Another stakeholder requested EPA to allow all displays in the 30"-61" size range to use the P On Max limits: $(0.27 \times A) + 8.0$, as there are other types of displays in this size range (such as those used with Workstations).</p> <p>Another stakeholder requested the removal of the 4.096MP resolution cap as there is an emerging class of high resolution displays that will significantly exceed 4.096 MP which will require extra power in the delivery of greatly improved image quality.</p> <p>Another stakeholder recommended that EPA conduct further study to better understand the underlying reasons for low ENERGY STAR adoption in its Professional Signage category thus far. Given the inherent similarities between TVs and Professional Signage products, this low penetration value may be caused by a number of non-technical factors, such as limited manufacturer or reseller awareness of the ENERGY STAR program.</p>	<p>EPA does not have data to support providing additional power beyond that already provided as displays increase in screen size. As such, EPA maintains the previously proposed power limits for all displays of 30 to 61 inches.</p> <p>To better account for currently available products that deliver higher resolution image quality than is typical, EPA now proposes to base its allowance structure for higher resolution products on megapixel per square inch. A power allowance not to exceed 6 watts per megapixel is established based on a device with a resolution of 14,000 pixels per square inch. This change from a megapixel approach more appropriately ties the upper limit to resolution in relation to screen size and is consistent with the overall specification framework which ties allowances to both resolution and screen area. It translates into a slightly larger allowance for products with a very high pixel density than proposed in Draft 3. EPA will continue to monitor the market to understand if and how resolution may increase, especially among larger products, and to determine its impacts on power consumption.</p> <p>EPA agrees with stakeholders that there may be non-technical factors accounting for low ENERGY STAR participation in the signage display category. EPA will continue to develop approaches to increase the participation of professional/signage display manufacturers in the ENERGY STAR Display program.</p>
10	Enhanced-Performance Displays - Number of Criteria	<p>Several stakeholders supported EPA's decision to consider a category for enhanced-performance displays, but commented that only 1 of the 3 criteria (contrast ratio, color gamut, and resolution) should be met to acquire the adder. This will cover an overall performance display in performance monitors like large size or high-resolution or high color gamut.</p> <p>Another stakeholder commented that the key requirements are color accuracy and high enough resolution, thus the color gamut and megapixels specs are critical in defining high performance. Another stakeholder commented that contrast ratio was the determining factor in defining an enhanced performance display.</p> <p>Another stakeholder recommended a reporting requirement to validate conformance to the defined criteria. Measurement should be included for static contrast ratio and color gamut.</p>	<p>Based on discussions with industry representatives and market analysis, EPA believes that a display must meet all three criteria for an enhanced-performance display in order to be accurately distinguished from a regular computer monitor.</p> <p>To alleviate the burden of testing and verification, EPA proposes for requirement conformance to be determined by CBs based on a reported basis, without actual measurement conducted by an EPA-recognized laboratory.</p>
11	Enhanced-Performance Displays - Contrast Ratio	<p>Several stakeholders requested that the option of measuring contrast ratio with or without the display cover glass is left up to the manufacturer. One stakeholder commented that the thickness of the display cover glass does not allow their measuring tools to focus properly on the display. There are meters that are intended to be in direct contact with the LCD panel and measuring the contrast ratio directly on the panel (without the cover glass) would not significantly impact the test results.</p> <p>Another stakeholder raised concern that the specifications of commonly used panels do not contain the contrast ratio at 85° and the types of panels that satisfy this requirement are limited, and there is concern that the requirement may only be met by specific types of products of specific vendors.</p> <p>Another stakeholder requested that display technology type should be considered in the criteria. Another stakeholder asked how the CBs will be verifying the contrast ratio criterion.</p>	<p>Based on stakeholder feedback noting that contrast ratio measurement at wide angles would not be possible with the screen cover glass on, EPA proposes for these measurements to be conducted with the glass off.</p> <p>EPA's intent in proposing a definition for an enhanced-performance display is to distinguish a select line of display products that offer enhanced features, such as an improved contrast ratio at extreme angles. Therefore, EPA proposes retaining the contrast ratio at 85° in order to clearly segment traditional displays products and enhanced-performance displays.</p> <p>The general ENERGY STAR program-wide policy is to remain technology-neutral when rewarding efficient use of energy. Thus, EPA does not propose to include select technologies, such as IPS or VA, as a requirement.</p>

12	Enhanced-Performance Displays - Color Gamut	<p>One stakeholder suggested using the NTSC ratio for color gamut, which would be the ratio equivalent to the present requirement for sRGB, which is 70% or more. Alternatively, the WinColorSpec application can be used, since WinColorSpec defined by Microsoft provides the definition of specifications for meeting the requirement for sRGB including tolerance.</p> <p>Another stakeholder provided examples of market segmentation based on the criteria: medical monitor has higher megapixel or higher bit rate, like 10bits, for accuracy of image(b). Graphic monitors for Computer graphic users have larger screen and sRGB or Adobe RGB to create realistic images(c). Broadcasting monitors or satellite monitors have higher contrast ratio to express gradation of color/gray and wide viewing angle for many(a).</p> <p>Another stakeholder suggested subdividing the condition and make classes in Enhanced display. There's Adobe RGB for graphic users in computer monitor market. Adobe RGB needs more power consumption relatively.</p>	<p>Based on further research and discussions of color spaces that are achievable by current monitors, EPA believes that the sRGB color gamut accurately represents enhanced color quality of a display. EPA proposes not to complicate the requirements further based on different types of color gamut classification (e.g., NTSC, sRGB, Adobe) since the intent of the criterion is to distinguish a set of enhanced-performance displays from the rest.</p>
13	Enhanced-Performance Displays - Resolution	<p>One stakeholder requested that the resolution criterion be changed from 2.3MP to 1.9MP because 1.9 megapixels is sufficiently regarded as enhanced performance monitors.</p> <p>Another stakeholder proposed 2.0MP, or, if 2.3MP is kept, then include another criterion on size, such as 24 inches or more.</p>	<p>EPA proposed a 2.3MP resolution requirement to harmonize with the definitions under consideration by the EU and CSA. In addition, 2.3MP provides as an effective distinction because it is higher than the popular 1080p HDTV resolution of 2.079MP, which is currently a rising trend among most monitors.</p> <p>Given the recent emergence of enhanced-performance displays in the smaller display sizes (e.g., 18", 22"), EPA does not propose to include a size requirement in the definition of an enhanced-performance display.</p> <p>To account for smaller size enhanced-performance displays, EPA considered using a requirement based on pixels per square inch instead of megapixels. However, analysis of the EPA dataset and the enhanced-performance display data submitted by stakeholders does not demonstrate that pixels per square inch are an appropriate criterion for distinguishing enhanced resolution quality.</p>
14	Enhanced-Performance Displays - Adder	<p>One stakeholder commented that the enhanced performance display adder is insufficient for products with a diagonal screen size of greater than 25 inches. This could be a combination of the base on mode levels being too low and the 20% allowance being too low.</p> <p>Another stakeholder commented that there will be several models under the high performance monitor category that will not be able to meet the requirement. Another stakeholder noted that the 'on mode criteria for enhanced performance display' of Draft 3 do not cover overall 'enhanced performance monitors'.</p>	<p>Based on EPA's dataset and after receiving additional information from stakeholders, EPA proposes to increase the adder to 30% of the On Mode limit, up from 20%, as this will provide more opportunity for larger products to meet the proposed On Mode power levels. EPA proposes to grant this adder to displays that meet all of the criteria for an enhanced-performance display.</p> <p>EPA's intent in proposing a definition for an enhanced-performance display is to distinguish a select line of display products that offer enhanced features, such as an improved contrast ratio at extreme angles. There would be no need for creating such a category if most products could meet the enhanced-performance requirements.</p>

15	ABC	<p>One stakeholder commented that in order for ABC to be impactful to power savings, the display needs to experience variability in the ambient lighting environment, which not be the case with monitors. Also important to incentivizing ABC adoption is a simple test method that does not add to the burden of qualification or product design.</p> <p>Another stakeholder mentioned that the 10% power allowance is good but it requires a test method that better simulates real world ambient lighting conditions to be effective. In addition, section 3.6.1 should clarify that for displays with ABC enabled, reporting of as-shipped luminance is not applicable, since the luminance will vary depending upon the ambient lighting of the customer's installation.</p> <p>Another stakeholder asked whether the weighting for the ABC power consumption is $0.25 \cdot P_{10} + 0.25 \cdot P_{100} + 0.25 \cdot P_{300} + 0.25 \cdot P_{500}$.</p> <p>Another stakeholder voiced support for incentivizing ABC, but stressed the importance of an accurate implementation of the feature, which includes creating an accurate test environment and procedure. In addition, placing a 20% minimum power reduction to qualify for the ABC adder (20% power reduction) may limit manufacturer participation and therefore the number of models implementing ABC. EPA should review the potential trade-offs of lowering the minimum ABC reduction with an increase in manufacturer participation.</p>	<p>EPA and DOE understand stakeholders' concern over an accurate and repeatable ABC measurement and therefore propose modifications to the test method.</p> <p>Regarding the as-shipped luminance for ABC-enabled displays, the Draft 3 Displays Test Method included a clarification to disable ABC for luminance testing, and if the ABC cannot be disabled, to measure the luminance with ambient lighting of greater than or equal to 500 lux.</p> <p>The treatment of ABC-enabled displays proposed in the Draft 3 Displays specification does not weigh power measured at individual lux levels. To receive an adder for implementing ABC, a product must show a power difference of 20%, of the 300 lux measurement, for power measured at 10 lux and 300 lux.</p> <p>When developing the proposed approach to incentivizing ABC, EPA considered various power reduction requirements and the corresponding adder values, reaching the 20% value based on data from qualified products and data from the Televisions specification. Therefore, EPA proposes to keep the 20% power reduction requirement.</p>
16	Data/Network Connections - Connections	<p>One stakeholder suggested adding further explanations for the speeds of USB.</p> <p>Another stakeholder requested that the occupancy sensor should be clearly defined. Also, it should be clarified whether operation of the occupancy sensor while in sleep mode is essential in its application. If the period during operation of a device similar to a human detection sensor is considered, then +1.5W should be added to the value currently being proposed.</p> <p>Another stakeholder commented that, in the case of Wi-Fi connections, the required extra power could range up to 10 watts. This is because many Wi-Fi implementations require an external wireless transceiver to be connected to the display via a USB port. The power used by the external transceiver could be subtracted when reporting the standby power with an active wireless connection.</p>	<p>In Draft 3, EPA proposed an adder of 0.5W for occupancy sensors in Sleep Mode based on data submitted by stakeholders. EPA has included a definition for an occupancy sensor in the specification.</p> <p>In the case of a wireless transceiver, it would be considered a peripheral device which would not be connected during testing and would therefore not require an adder.</p>
17	Data/Network Connections - Adder	<p>One stakeholder asked if P_{dn} is 1.2W ($=0.7W + 0.5W$), when a product has DisplayPort and USB 2.x.</p> <p>Another stakeholder asked if the sleep mode limit calculates to 1.7W ($0.5 + 0.5 + 0.7$) for products with USB 2.x and display port. The stakeholder also asked if 2W is added when there is a product with 2 upstream USB 2.x and 2 downstream USB 2.x.</p>	<p>As stated in the Draft 3 Test Method, either a single data connection or a single network connection shall be made during testing. As stated in the Draft 3 Specification, only those data or network connections that were made during testing shall receive an adder in Sleep Mode. If the DisplayPort is not transferring a video signal and instead being used for data transfer, then it can be considered as a data connection for ENERGY STAR Displays.</p> <p>In the case of a DisplayPort port and a USB 2.x port, where DisplayPort is used for transferring the video signal and the USB is used for transferring data, both shall be connected during testing, but the adder would only be for the USB 2.x: Total Sleep Mode Limit ($PSLEEP_AP$)= $0.5W + 0.5W = 1W$</p> <p>If there are multiple USB ports, only one of the upstream ports shall be connected during testing and only that port will receive an adder: Total Sleep Mode Limit ($PSLEEP_AP$)= $0.5W + 0.5W = 1W$</p>

18	Data/Network Connections - Ethernet	<p>One stakeholder supported incentivizing Energy Efficient Ethernet (EEE) but mentioned that typically Ethernet will be used for connecting a display to an external network, not for bridging a network between the display and the host computer.</p> <p>Another stakeholder commented that, in the case of a wired Fast Ethernet connection, a minimum of 0.2 watts allowance PDN is recommended because in order to enable a Fast Ethernet connection, the Physical Layer LSI must be powered On. Typical LSI's for this function consume 174.9 mW or 161.37 mW. Thus, 0.2 watts (200 mW) is recommended for the extra allowance for the wired Fast Ethernet connection. In addition, power consumption of a signage display network may differ from monitors since professional signage displays will often use an Ethernet connection as a control port to remotely control the display and not for obtaining content from the Internet.</p> <p>Another stakeholder measured their products and found that the additional power consumption is about 1.5W with Ethernet connected. Another stakeholder commented that professional signage displays generally do not go into a sleep mode automatically. They generally need to go into a Standby-active, low mode which must provide enough power to detect an external signal. While 0.5W may be adequate for a computer monitor, it is not adequate for professional signage displays. Professional signage displays should be allotted 2W to allow Standby-active, low implementations as required by the signage display marketplace.</p>	<p>In response to stakeholder feedback, EPA has raised the adder for Fast Ethernet to 0.2W. Regarding the test setup for Ethernet connections, the Ethernet connection should be made between the display and an external network, and not the host computer. DOE and EPA have clarified this connection in the Test Method.</p> <p>Based on data submitted by stakeholders on power consumption of Ethernet ports in Sleep Mode, while not transferring data, and based on experience with Ethernet power consumption from other ENERGY STAR specifications, EPA proposes to keep the Gigabit Ethernet adder at 0.7W for all displays, including monitors and signage displays.</p>
19	Power Management	<p>One stakeholder suggested to mention that for displays without a physical on/off button, the off mode power state is achieved by turning off or shutting down the host computer. In addition, for item 3.2.2.i, an explanation should be added that the power management feature could include responding to the off and sleep states of the host computer, since, for some displays, there is no internal power management, but simply the ability to reduce power based on signals from the host computer. For item iii, an explanation should be added that this feature is not applicable for some displays that have no internal power management, but simply reduce power based on signals from the host computer. The default delay time for transitioning to sleep or off states is controlled from by host computer, not the display itself.</p> <p>Another stakeholder commented that all of their display products enter the "sleep" mode whenever the display is disconnected from the source (drop either H or V sync). During this disconnected state, the products consume 0.5W-2.20W.</p>	<p>According to stakeholder feedback on the power management behavior of monitors when they are disconnected from a computer without being turned off, most monitors on the market today enter Sleep Mode after the connection to a host is discontinued.</p> <p>According to stakeholder feedback on the power management behavior of monitors when they are disconnected from a computer without being turned off, most monitors on the market today enter Sleep Mode after the connection to a host is discontinued. As such, EPA proposes to require this power management feature for all ENERGY STAR qualified computer monitors.</p>
20	Effective Date	<p>One stakeholder asked to have the effective date extended to nine months after the official release of the final Energy Star 6.0 specification because manufacturers must have sufficient time to incorporate the new requirements into product designs.</p> <p>Another stakeholder recommended April 2013 for the effective date to better align the specification with new product release timing and allows for engineering resources to be efficiently utilized in getting more efficient designs out to the market.</p>	<p>At this time EPA anticipates finalizing Version 6.0 in July 2012, where the specification would then become effective in April 2013, 9 months after the release of the final specification.</p>

21	Non-Energy Requirements	All Comments	<p>While energy efficiency remains the basis upon which top performers are selected, EPA addresses attributes related to other aspects of product performance in ENERGY STAR specifications as applicable to ensure that overall product performance is maintained relative to a non-qualifying product. By including additional attributes, the ENERGY STAR program seeks to avoid associating the label with models of poor quality or models with features that are not compatible with broadly held consumer or societal interests, thereby preserving the influence of the label in the market. In response to stakeholder concern that placement of toxicity and recyclability requirements in the product eligibility criteria could hinder international harmonization, EPA is proposing that these criteria reside instead in the ENERGY STAR Displays Partner Commitment document, which is unique to the US market. As such, EPA has removed section 3.7, Toxicity and Recyclability requirements from the Displays eligibility criteria. Further, in response to feedback, EPA notes that it is the Agency's intention to harmonize with EU RoHS and that the toxicity and recyclability requirements are not subject to third-party certification.</p>
----	-------------------------	--------------	---